

3.3.1.4 Inland Lakes

3.3.1.4.1 Community Overview

Inland lakes are naturally occurring bodies of standing water with a huge diversity in size, configuration, water chemistry, and biota. Their surface area can range from less than one acre to over 137,000 acres and their depth can range from less than a foot to more than 230 feet. Glaciation, post-glacial water flow, soil characteristics, topography, bedrock composition, land cover, land use and other factors can all combine to determine the physical and chemical characteristics of any given lake. The concentration of glacial kettle lakes within the Northern Highlands Ecological Landscape is globally important. Some of the lake types there are rare, and support many rare organisms.

Natural lakes in Wisconsin frequently are classified by the source of water supply. Based on water source and outflows, four categories of lakes are commonly recognized:

- **Drainage lakes** – These lakes have both an inlet and outlet where the main water source is stream drainage. Most major rivers in Wisconsin have drainage lakes along their course. Drainage lakes owing one-half of their maximum depth to a dam are considered to be artificial lakes or impoundments (see Section 3.3.1.3 for information regarding impoundments/reservoirs).
- **Seepage lakes** – These lakes do not have an inlet or an outlet, and only occasionally overflow. As landlocked waterbodies, the principal source of water is precipitation or runoff, supplemented by groundwater from the immediate drainage area. Since seepage lakes commonly reflect groundwater levels and rainfall patterns, water levels may fluctuate seasonally. Seepage lakes are the most common lake type in Wisconsin.
- **Spring lakes** – These lakes have no inlet, but do have an outlet. The primary source of water for spring lakes is groundwater flowing into the bottom of the lake from inside and outside the immediate surface drainage area. Spring lakes are the headwaters of many streams and are a fairly common type of lake in northern Wisconsin.
- **Drained lakes** – These lakes have no inlet, but like spring lakes, have a continuously flowing outlet. Drained lakes are not groundwater-fed. Their primary source of water is from precipitation and direct drainage from the surrounding land. Frequently, the water levels in drained lakes will fluctuate depending on the supply of water. Under severe conditions, the outlets from drained lakes may become intermittent. Drained lakes are the least common lake type found in Wisconsin.

Lakes vary based on physical characteristics, such as size, depth, configuration, chemical characteristics (such as soft versus hard water), water clarity, or the types of plant and animal life present. For example, Some lakes are almost perfectly round in shape whereas others are highly convoluted. Hard water lakes have higher levels of dissolved minerals such as calcium, iron and magnesium than soft water lakes. Some lakes, especially those near acidic wetlands such as bogs, are stained with tannic acid that leaches from surrounding vegetation. The water in these “tannin lakes” may range in color from a dark brown “coffee” color to light brown.

These waterbodies also vary greatly in fertility and clarity, with clearer, lower fertility lakes more common in northern Wisconsin. Large, fertile, southern Wisconsin lakes with stream inlets and outlets generally have the greatest variety of species. Most lakes are dominated by cool and warmwater fishes, particularly the family Centrarchidae (sunfishes).

3.3.1.4.2 Vertebrate Species of Greatest Conservation Need Associated with Inland Lakes

Twenty-nine vertebrate Species of Greatest Conservation Need were identified as moderately or significantly associated with inland lakes (Table 3-54).

Table 3-54. Vertebrate Species of Greatest Conservation Need that are (or historically were) moderately or significantly associated with inland lakes.

<i>Species Significantly Associated with Inland Lakes</i>
Birds
Osprey
Bald Eagle
Fish
Lake Sturgeon
Starhead Topminnow
Herptiles
Mudpuppy
Blanchard's Cricket Frog
Boreal Frog
Mink Frog
Blanding's Turtle
Northern Ribbon Snake
Mammals
Moose
<i>Species Moderately Associated with Inland Lakes</i>
Birds
Trumpeter Swan
Blue-winged Teal
Canvasback
Lesser Scaup
Black Tern
Fish
Pugnose Shiner
Lake Chubsucker
Greater Redhorse
Banded Killfish
Longear Sunfish
Least Darter
Herptiles
Pickerel Frog
Queen Snake
Mammals
Water Shrew
Northern Long-eared Bat
Silver-haired Bat
Eastern Red Bat
Hoary Bat

In order to provide a framework for decision-makers to set priorities for conservation actions, the species identified in Table 3-54 were subject to further analysis. The additional analysis identified the best opportunities, by Ecological Landscape, for protection, restoration, and/or management of both inland lakes and associated vertebrate Species of Greatest Conservation Need. The steps of this analysis were:

- Each species was examined relative to its probability of occurrence in each of the 16 Ecological Landscapes in Wisconsin. This information was then cross-referenced with the opportunity for protection, restoration, and/or management of inland lakes in each of the Ecological Landscapes (Tables 3-55 and 3-56).
- Using the analysis described above, a species was further selected if it had both a significant association with inland lakes and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of inland lakes. These species are shown in Figure 3-4.

Table 3-55. Vertebrate Species of Greatest Conservation Need that are (or historically were) *significantly* associated with inland lakes and their association with Ecological Landscapes that support inland lakes.

Inland Lakes	Birds (2)*		Fish (2)		Herptiles (6)						Mammals (1)
	Osprey	Bald Eagle	Lake Sturgeon	Starhead Topminnow	Mudpuppy	Blanchard's Cricket Frog	Boreal Chorus Frog	Mink Frog	Blanding's Turtle	Northern Ribbon Snake	Moose
MAJOR											
Central Sand Hills											
North Central Forest											
Northern Highland											
Northwest Sands											
Southeast Glacial Plains											
IMPORTANT											
Forest Transition											
Northeast Sands											
Northern Lake Michigan Coastal											
Southern Lake Michigan Coastal											
PRESENT (MINOR)											
Central Lake Michigan Coastal											
Central Sand Plains											
Northwest Lowlands											
Superior Coastal Plain											
Western Prairie											

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Table 3-56. Vertebrate Species of Greatest Conservation Need that are (or historically were) *moderately* associated with inland lakes and their association with Ecological Landscapes that support inland lakes.

Inland Lakes	Birds (5)*					Fish (6)						Herptiles (2)		Mammals (5)				
	Trumpeter Swan	Blue-winged Teal	Canvasback	Lesser Scaup	Black Tern	Pugnose Shiner	Lake Chubsucker	Greater Redhorse	Banded Killifish	Longear Sunfish	Least Darter	Pickereel Frog	Queen Snake	Water Shrew	Northern Long-eared Bat	Silver-haired Bat	Eastern Red Bat	Hoary Bat
Ecological Landscape grouped by opportunity for management, protection, and/or restoration of this community type																		
MAJOR																		
Central Sand Hills																		
North Central Forest																		
Northern Highland																		
Northwest Sands																		
Southeast Glacial Plains																		
IMPORTANT																		
Forest Transition																		
Northeast Sands																		
Northern Lake Michigan Coastal																		
Southern Lake Michigan Coastal																		
PRESENT (MINOR)																		
Central Lake Michigan Coastal																		
Central Sand Plains																		
Northwest Lowlands																		
Superior Coastal Plain																		
Western Prairie																		

Color Key

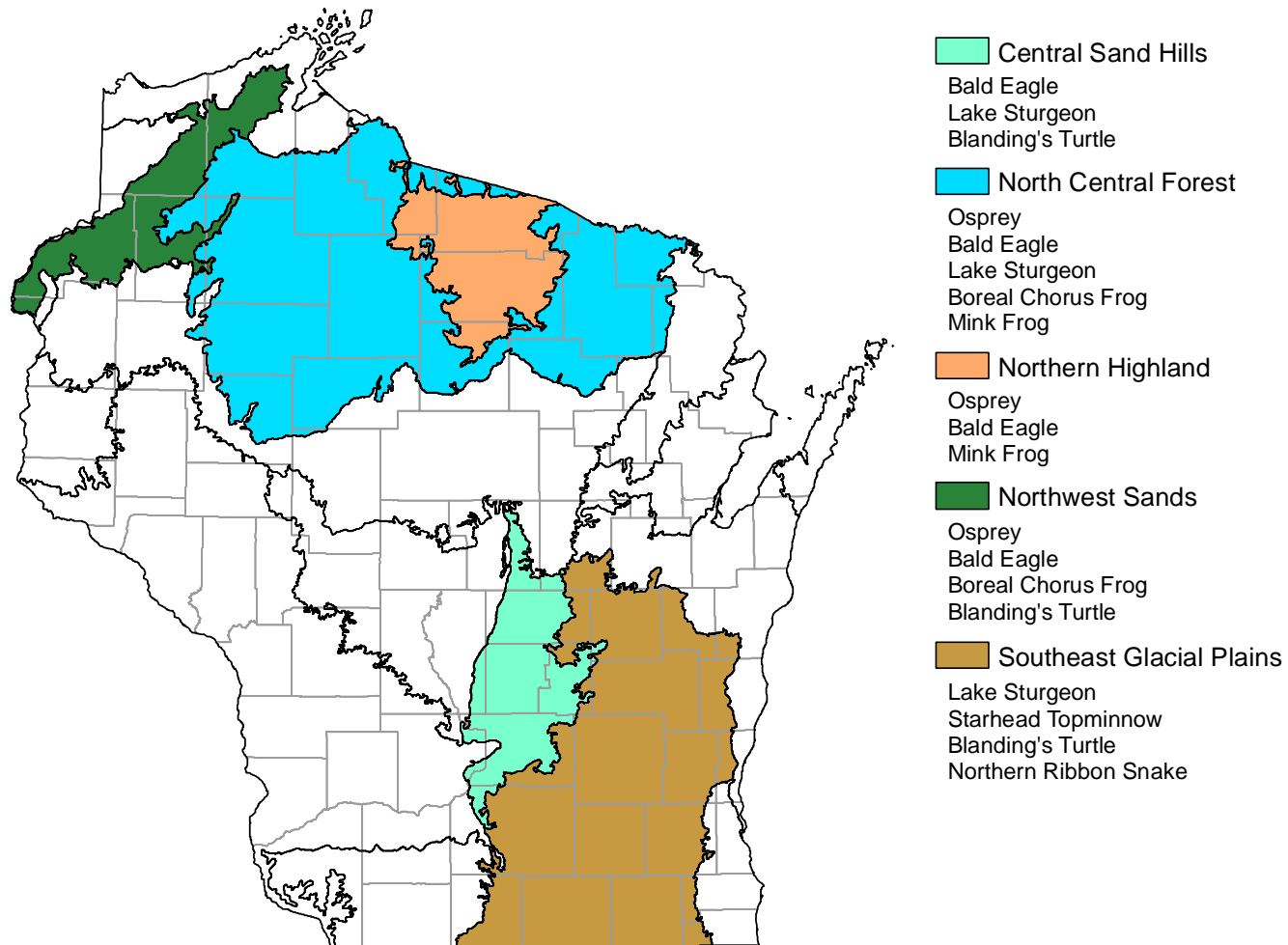
= HIGH probability the species occurs in this Ecological Landscape

= MODERATE probability the species occurs in this Ecological Landscape

= LOW or NO probability the species occurs in this Ecological Landscape

* The number shown in parentheses is the number of Species of Greatest Conservation Need from a particular taxa group that are included in the table. Taxa groups that are not shown did not have any Species of Greatest Conservation Need that met the criteria necessary for inclusion in this table.

Figure 3-4. Vertebrate Species of Greatest Conservation Need that have both a significant association with inland lakes and a high probability of occurring in an Ecological Landscape(s) that represents a major opportunity for protection, restoration and/or management of inland lakes.



3.3.1.4.3 Threats and Priority Conservation Actions for Inland Lakes

The following list of threats and priority conservation actions were identified for inland lakes in Wisconsin. The threats and priority conservation actions described below apply to all of the Ecological Landscapes in Tables 3-55 and 3-56 unless otherwise indicated.

Threats and Issues

- Changing land use practices and resulting non-point source pollution from urban and agricultural runoff and other sources are leading to habitat loss, eutrophication, and increases in salinity.
- Shoreline and littoral-zone alteration and development, as well as shallow-water motorized recreation, are degrading lake habitat.
- Mercury bioaccumulation in fish poses a health risk to humans and other animals that eat fish, especially in waters with sediments that increase the rate of mercury methylation.
- Exotic invasive plant and animal species (e.g., common carp, rainbow smelt, zebra mussel, rusty crayfish, Eurasian water-milfoil, curly pondweed, flowering rush) are degrading habitats, altering food webs and species interactions, and displacing native species. Other exotics, such as the parasite *Heterosporis sp.*, are spreading to lakes across northeast Wisconsin, infecting yellow perch and other species.

Priority Conservation Actions

- Improve watershed and riparian land-use practices to reduce non-point source pollution.
- Protect and restore shoreline and littoral-zone habitat. Support shoreline research, education, and restoration conducted by lake districts, UW-Extension and other institutions, restoration consultants, and others.
- Improve regulations and education regarding actions such as boat cleaning and disinfection to prevent the introduction of additional exotic species and slow the spread of existing populations of invasive species.
- Continue to seek statewide and regional reductions in mercury emissions from key sources.